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EXPLOSIONS IN ALABAMA COAL MINES

BY

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EXPLOSIONS IN ALABAMA COAL MINES [1]

By F. E. Cash [2] and H. B. Humphrey [3]

From 1900 to 1929, 1,005 or approximately 30 per cent of all fatalities in the coal mines of Alabama were caused by fires or explosions of gas and dust. In the 3-year period from 1927 to 1929 only 15 men were killed by these causes, a reduction from 30 to 9 per cent of the total. Notwithstanding this marked improvement, which is due largely to the efforts made by the State inspection department, the operators, and the Bureau of Mines to stamp out this type of disaster, Alabama still has more than its share of such fatalities which can and should be prevented.

A list of explosions from 1894 to 1929 compiled from information obtained through the records of the State Inspector's office, the reports of Engineers of the Bureau of Mines, and the operators, is given in Table 1.

Table 1. - Alabama - gas and dust ignitions, etc., 1893 - 1929.

Date	Mine	Type	Cause	No. killed
1894 2/15	Blocton No. 2.	Fire	Spontaneous comb.	1
1895 2/24	No. I Slope	Gas	Blown-out shot.	2
1895 3/16	Sumter	do	Ignited by open light.	1
1895 4/4	Coalburg	do	do	1
1895 7/9	No. I Slope	Gas explosion	Open light.	1
1897 3/24	Blocton No. 2	Gas	Blown-out shot.	4
1897 9/20	Belle Ellen	Fire	Open light.	5
1898 3/19	No. 2 Slope.	Gas explosion	Open light.	6
1898 5/26	Hargrove	do	do	2
1898 8/15	New Castle	do	do	2
1899 2/21	Blocton No. 2	do	Blown-out shot.	5
1899 3/9	Patton No. 2	do	do	1
1900 4/13	Hargrove	do	Ignited by open light.	1
1900 8/10	do	Gas suffocation	do	1
1900 9/25	do	Gas	do	1
1901 5/6	Johns	do	do	1
1901 7/27	Zenida	Gas explosion	do	1
1902 1/2	Searles	Dust explosion	Blown-out shot.	1
1902 2/3	Little Creek	do	do	1
1902 3/3	Warrior No. 2	Gas dust explosion	do	1
1905 2/20	Virginia City	do	do	108
1906 2/27	Piper No. 2	Dust explosion	do	12
1907 7/11	Palos No. 3	Gas explosion	Open light	1

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6352."

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TABLE NO. I (continued)

ALABAMA-- Gas and Dust Ignitions, etc., 1893 - 1929.

Date	Mine	Type	Cause	No. killed
1907 10/4	Pratt No. 7	Gas explosion	Open light	3
1907 12/16	Yolande No.I	Gas and dust explosion	do	57
1907 12/28	Mulga	Gas	Ignited by open light	1
1908 2/8	Blocton	do	do	1
1908 2/13	Belle Ellen	do	do	1
1908 2/14	Banner	do	do	2
1908 5/29	Pratt No. 2	do	do	1
1908 6/24	Banner	Dust explosion	Blown-out shot	1
1908 8/24	Elvira	Gas explosion	Open light	1
1908 9/1	Blossburg	do	Open light	3
1908 10/26	Short Creek	Dust Explosion	Blown-out shot	6
1908 11/16	Pratt No. 3	Fire, suffocation	Built wood fire	8
1908 12/30	Blocton	Dust explosion	Blown-out shot	3
1909 1/4	Coalmont	Gas	Ignited by open light	1
1909 1/12	Elvira	do	do	1
1909 2/2	Short Creek	Dust explosion	Blown-out shot	18
1909 5/13	Burnwell	Gas	Ignited by open light	2
1909 10/5	Yolande No. I	Gas explosion	Open light	3
1909 12/29	Coleanor	do	do	1
1910 1/3	New Connellsville	do	do	2
1910 4/14	Docena	do	do	1
1910 4/20	Mulga	Gas and dust explosion	do	40
1910 5/5	Palos No. 3	Gas and dust explosion	Black powder	90
1910 9/21	Belle Ellen	Gas explosion	Open light	1
1910 11/3	Yolande	Gas and dust explosion	Blown-out shot	5
1910 12/8	Dolomite	Gas explosion	do	1
1911 4/8	Banner	Gas and dust explosion	Open light	128
1911 7/2	Coleanor	Gas explosion	do	1
1911 8/28	Blue Creek	do	do	1
1912 4/14	Hargrove	do	do	1
1912 4/29	Marvel No. 2	do	do	1
1912 7/2	Belle Jay	do	do	1
1912 7/9	Margaret No.1	do	do	1
1912 8/13	Abernant	Gas and dust explosion	do	18
1912 9/8	Great Elk	Gas explosion	do	1
1912 10/5	Belle Ellen	do	do	1
1912 10/6	Banner	do	do	1
1912 12/20	Margaret No.I	Gas	Ignition by open light	1
1913 3/24	Indio	do	do	3
1913 11/18	Acton No 2	Gas and dust	Ignition by Black powder shot	24
1914 1/10	Rock Castle	Gas and dust explosion	Open light	12

TABLE NO. I (continued)

ALABAMA- Gas and Dust Ignitions, etc., 1893 - 1929.

Date	Mine	Type	Cause	No. Killed
1914 4/16	Piper No.2	Gas	Ignition by open light	2
1914 8/14	Edgewater	do	do	1
1914 9/8	Piper No. 2	do	do	1
1914 10/5	Mulga	do	do	17
1914 10/31	Coleanor	do	do	3
1914 11/2	Acmar	do	do	1
1915 4/23	Aldrich	Gas explosion	Open light	4
1915 7/27	Piper No. 2	Gas Ignition	Open light	1
1915 9/11	Banner	Gas explosion	Open light	2
1916 1/26	Edgewater	do	Ignition by black powdershot	1
1916 4/1	Aldrich	do	Ignition by open light	1
1916 4/24	Johns	do	do	1
1916 5/13	Belle Ellen No.2	do	do	1
1916 6/15	Coalmont No. 2	Dust explosion	Blown-out shot	2
1916 10/22	Marvel No. 2	Gas and dust explosion	Elec.arc knife switch	18
1916 11/4	Bessie	do	Open light	30
1917 1/7	Palos No. 3	Gas explosion	do	1
1917 2/9	Galloway No.11	do	do	1
1917 6/13	Banner	Gas and dust explosion	do	6
1917 7/11	New Castle No.2	Gas explosion	do	1
1917 8/2	Belle Ellen No.2	do	do	2
1917 10/6	Marvel No. 2	do	do	1
1918 4/3	Bayview	Gas and dust explosion	do	2
1918 7/6	Margaret No. 1	Gas	Ignition by open light	3
1918 9/20	Wylam No. 8	Gas explosion	Open light	2
1918 10/30	Townley No. 2	do	do	1
1918 12/14	Klondike	CO_2	Suffocation	1
1919 2/7	Acmar No. 3	Gas and dust explosion	Open light	1
1919 4/29	Majestic	do	do	22
1919 11/29	Belle Ellen No.2	Gas explosion	do	1
1920 3/1	Margaret No. 2	do	do	1
1920 11/23	Parrish	do	do	12
1921 3/10	Acmar No. 3	do	do	1
1921 12/19	Acmar No. 2	do	do	1
1921 12/31	Docena	do	do	5
1922 2/2	Belle Ellen No. 2	do	do	9
1922 3/21	Whites	Gas	Suffocation	1
1922 5/25	Acmar No. 3	Gas and dust explosion	Open light	11
1922 10/9	Marvel No. 2	Gas explosion	do	1
1922 11/22	Dolomite No. 3	Dust explosion	Elec. arc.	90
1923 1/10	Dolomite No. 1	Gas explosion	Open light	5
1923 9/13	Piper No. 2	do	do	1

TABLE NO. I (continued)

ALABAMA-- Gas and Dust Ignitions, etc., 1893 - 1929.

Date	Mine	Type	Cause	No. Killed
1923 11/12	Dixie	Gas explosion	Open light	2
1924 7/14	Risco	do	do	1
1924 10/13	Wylam	do	do	1
1925 2/2	Calumet No. 2	Gas	Ignition by Open light	1
1925 5/31	Piper No. 2	Gas explosion	Opening fire seals	7
1925 7/6	Straven	do	Open light	1
1925 8/24	Acmar No. 3	do	do	1
1925 8/27	Dogwood	do	do	2
1925 8/28	Coleanor	do	do	1
1925 9/8	Helena Straven	do	do	1
1925 12/10	Overton No. 2	Gas and dust explosion	do	53
1926 1/29	Mossboro	Dust explosion	Blown-out shot (B. P.)	27
1926 6/10	Majestic	Gas explosion	Open light	4
1926 7/21	Dixie	do	do	9
1926 12/19	Dixiana	do	do	1
1927 6/3	Flat Top	do	do	1
1927 10/18	Coleanor	do	do	1
1927 11/18	New Castle No.2	Gas and dust explosion	do	1
1929 1/12	Powhatan	Gas explosion	do	1
1929 5/27	Connellsville	Gas and dust explosion	Elec.arc-hoist.	10
1929 10/14	Gamma	Gas explosion	Open light	1

The causes are given as closely as could be ascertained for all of the occurrences listed. The cause in the majority of instances is well established, especially in those explosions falling under the head of major disasters in which 5 or more men were killed, given in Table 2.

Table 2. - ALABAMA - Reports of Bureau of Mines on major disasters

Date	Mine	Killed			Type	Origin
		Flame - violence	Gas	Total		
1897	Belle Ellen	-	5	5	Fire	Open light
1898	No. 2. Slope	-	-	6	Gas ex.	do
1899	Blocton No. 2	-	5	5	do	Blown-out shot
1905	Virginia City	-	-	108	Gas and dust	do
1906	Piper No. 2	-	-	12	Dust ex.	do
1907	Yolande No. 1	-	-	57	Gas and dust	Open light
1908	Short Creek	-	-	6	Dust ex.	Blown-out shot
1908	Pratt No. 3	-	8	8	Fire	Built wood fire
1909	Short Creek	-	-	18	Dust ex.	Blown-out shot
1910	Mulga	-	-	40	Gas and dust	Open light
1910	Palos No. 3	-	-	90	do	Blown-out shot
1910	Yolande	-	-	5	do	do
1911	Banner	64	64	128	do	Open light
1912	Abernant	-	-	18	do	do
1913	Acton No. 2	13	11	24	do	Blown-out shot
1914	Rock Castle	4	8	12	do	Open light
1914	Mulga	1	16	17	Gas ex.	do
1916	Marvel No. 2	6	12	18	Gas and dust	Electric arc
1916	Bessie	16	14	30	do	Open light
1917	Banner	-	6	6	do	do
1919	Majestic	12	10	22	do	do
1920	Parrish	9	3	12	Gas ex	do
1921	Docena	3	2	5	do	do
1922	Belle Ellen No.2	6	3	9	do	do
1922	Acmar No. 3	11	-	11	Gas and dust	do
1922	Dolomite No 3	60	30	90	Dust ex.	Electric arc
1923	Dolomite No 1	5	-	5	Gas ex	Open light
1925	Piper No. 2	7	-	7	do	Opening fire seals
1925	Overton No. 2	24	29	53	Gas and dust	Open light
1926	Mossboro	10	17	27	Dust ex.	Blown-out shot
1926	Dixie	9	-	9	Gas Ex	Open light
1929	Connelsville	7	3	10	Gas and Dust	Electric arc

Of all the disasters listed 93, or 73 per cent, were caused by the ignition of methane and resulted in 192 deaths; 10, or 8 per cent, were from the explosion of suspended dust and resulted in 161 deaths; 20, or 16 per cent, were combined gas and dust explosions and resulted in 637 deaths; and 4 others, or 3 per cent, were due to fires and carbon monoxide, causing 15 deaths.

Table 3. - Explosions classified by type

Type	All explosions		Exp.,	Fat.,	Major disasters		Exp.,	Fat.,
	No.	Fatalities	percent	percent	No.	Fatalities	percent	percent
Gas	93	192	73	19	9	75	28	9
Dust	10	161	8	16	5	153	16	18
Gas and dust	20	637	16	64	16	632	50	71
Fires	4	15	3	1	2	13	6	2
Total	127	1005	100	100	32	873	100	100

From this summary it is evident that an accumulation of sufficient methane to kill the man igniting it and very often others in the close vicinity has happened frequently. "Local gas ignitions" even if insufficient dust was raised to spread the explosion where rock-dusting had not been done were potential major disasters. The explosions of dust alone have been few in number but by their nature considerably more destructive than the first type. Only one has occurred in the past six years, and this was in a mine using black powder, shooting off the solid, and not rock-dusted. Of the 93 gas explosions that did not involve dust only 9 were major disasters (each resulting in death of 5 or more); of the 10 due to dust with resultant 161 fatalities 5 were of the major variety with 153 deaths. The deadly combination of gas and dust caused 64 per cent of all the deaths, almost all such explosions being classed as major disasters.

Table 4. - Explosions classified by origin

	All explosions		Exp.,	Fat.,	Major disasters		Exp.,	Fat.,
Origin	No.	Fatalities	percent	percent	No.	Fatalities	percent	percent
Open light	100	557	79	56	18	445	56	51
Blown-out shot	20	313	16	31	9	295	28	34
Electric arc	3	118	2	12	3	118	10	13
Miscellaneous	4	17	3	1	2	15	6	2
Total	127	1005	100	100	32	873	100	100

In origin open lights, commonly used in the district until the last fe years, are responsible for over half of the fatalities and about 80 per cent of th explosions. In the class of major disasters open lights were responsible for 51 per cent of the fatalities in 56 per cent of the disasters. Blown-out shots were second, with a record of one-third of the deaths in both classes, but only one explosion from this cause has been recorded in the past six years; in so far as can be learned the explosions due to blown-out shots have all involved black blasting powder or dynamite, and in no known instance has permissible explosive been involved. Electricity has not played as prominent a part in this district as in other States where it has been more commonly adopted. Mines equipped with extensive electric machinery also have rock-dust, water, and more or less adequate ventilation. Exceptions have occurred, even where these precautions had been partly used, but only three such explosions have occurred--one in 1916, with 18 fatalities; one in 1922, with 90 fatalities; and one in 1929, with 10 fatalities. This differs from the average of the United States, wherein during recent years 50 per cent or more of the explosions are of electrical origin.[4] Of these three, one was due to an arc from a defective knife switch, one from a cable cut by a wrecked trip, and one to nonpermissible controller and hoist in a poorly ventilated gassy mine. These three disasters caused 118 deaths.

As more machinery and electric power are used in the mines of the district greater care must be observed in keeping explosive mixtures of methane and air and sources of ignition apart if explosions are to be avoided. Ventilation at the faces must be maintained constantly and effectively; the fire bosses' inspections must be held to rigid standards; rock-dusting and wetting of cuttings must be part of daily routine operating practice; and where accumulations of gas are likely to occur only permissible equipment including closed lights should be used. If accumulations of methane do occur they should be moved by careful methods and preferably when all persons are out of the mine other than those engaged in moving the accumulation.

In the major disasters since 1913, approximately 203 men were killed by violence or flame and approximately 164 by the effects of the afterdamp. It would appear that one-third to one-half of the victims of explosions in Alabama mines might have been saved by the use of the numerous methods of barricading which have been used to very good effect in many mine fires and explosions in various parts of the United States especially during the past 15 years.

As long as open lights, matches, and open types of electrical equipment are allowed in coal mines local ignitions of gas or dust or both will continue to occur, and these local ignitions will be kept from growing into disasters only by effective ventilation and continued use of safeguards against dust. Proper inspection and the elimination of open lights and of open types of electrical equipment will tend to minimize the local ignitions to a point where they should be little if any more hazardous than floods in these mines.

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[4] Harrington, D., Some Phases of the Relative Responsibility of Management and Workers on Accidents in Mines; Rept. of Investigations 2993, Bureau of Mines, 1930

CONCLUSIONS

Explosions of all kinds are preventable in the coal mines of Alabama, as well as in the coal mines of all of the States, to the extent that precautions are adopted and maintained to eliminate them. If provision is made against major disasters only local ignitions will continue to occur; and with the new methods of mining, where men are now working in considerable numbers at relatively short distances apart, these local ignitions are very likely to result in multiple deaths. Careful inspection and removal of gas when found will avoid nearly all cases of "gas ignition" if open lights and open types of electrical equipment are not used in coal mines.

The use of permissible electrical and other equipment, permissible explosives, and adequate methods of ventilation and rock-dusting is necessary if coal mines are to eliminate certain types of explosions, and work without them in coal mines and more especially in gassy mines is now deliberate taking of chances of loss of the lives of all persons who are in the mine; in fact, there is more than a possibility of losing the mine itself as well.